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Report of the individual review of the annual submission of Croatia submitted in 2013*

* In the symbol for this document, 2013 refers to the year in which the inventory was submitted, and not to the year of publication.

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I. Introduction and summary

1. This report covers the review of the 2013 annual submission of Croatia, coordinated by the UNFCCC secretariat, in accordance with decision 22/CMP.1. The review took place from 16 to 21 September 2013 in Bonn, Germany, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: generalists – Mr. Harry Vreuls (Netherlands) and Ms. Melissa Weitz (United States of America); energy – Mr. Graham Anderson (Australia), Mr. Constantin Harjeu (Romania), Ms. Anna Sikharulidze (Georgia) and Mr. Sergiy Skybyk (Ukraine); industrial processes and solvent and other product use – Ms. Ingrid Person Rocha e Pinho (Brazil) and Mr. Samir Tantawi (Egypt); agriculture – Mr. Michael Anderl (Austria), Ms. Rocio Danica Condor (Italy) and Mr. Paulo Cornejo (Chile); land use, land-use change and forestry (LULUCF) – Mr. Manuel Estrada (Mexico), Ms. Akane Nagahisa (Japan) and Mr. Nalin Srivastava (India); and waste – Ms. Baasansuren Jamsranjav (Mongolia) and Mr. Gustavo Barbosa Mozzer (Brazil). Ms. Person and Mr. Vreuls were the lead reviewers. The review was coordinated by Ms. Kyoko Miwa (UNFCCC secretariat).

2. In accordance with the "Guidelines for review under Article 8 of the Kyoto Protocol" (decision 22/CMP.1) (hereinafter referred to as the Article 8 review guidelines), a draft version of this report was communicated to the Government of Croatia, which made no comment on it. All encouragements and recommendations in this report are for the next annual submission, unless otherwise specified.

3. In 2011, the main greenhouse gas (GHG) in Croatia was carbon dioxide (CO_2), accounting for 73.4 per cent of total GHG emissions[1] expressed in CO_2 equivalent (CO_2 eq), followed by methane (CH_4) (1[illegible]6 per cent) and nitrous oxide (N_2O) (12.3 per cent). Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6) collectively accounted for 1.7 per cent of the overall GHG emissions in the country. The energy sector accounted for 72.9 per cent of total GHG emissions, followed by the agriculture sector (12.1 per cent), the industrial processes sector (10.6 per cent), the waste sector (3.9 per cent) and the solvent and other product use sector (0.5 per cent). Total GHG emissions amounted to 28,421.47 Gg CO_2 eq and decreased by 10.3 per cent between the base year[2] and 2011. The expert review team (ERT) concludes that the description in the national inventory report (NIR) of the trends for the different gases and sectors is reasonable.

4. Tables 1 and 2 show GHG emissions from sources included in Annex A to the Kyoto Protocol (hereinafter referred to as Annex A sources), emissions and removals from the LULUCF sector under the Convention and emissions and removals from activities under Article 3, paragraph 3, and, if any, elected activities under Article 3, paragraph 4, of the Kyoto Protocol (KP-LULUCF), by gas and by sector and activity, respectively. In table 1, CO_2, CH_4 and N_2O emissions included in the rows under Annex A sources do not include emissions and removals from the LULUCF sector.

5. Additional background data on recalculations by Croatia in the 2013 annual submission, as well as information to be included in the compilation and accounting database, can be found in annex I to this report.

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[1] In this report, the term "total GHG emissions" refers to the aggregated national GHG emissions expressed in terms of CO_2 eq excluding LULUCF, unless otherwise specified.

[2] "Base year" refers to the base year under the Kyoto Protocol, which is 1990 for all gases. The base year emissions include emissions from Annex A sources only.

Table 1
Greenhouse gas emissions from Annex A sources and emissions/removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, by gas, base year[a] to 2011

			Gg CO_2 eq								*Change (%)*
		Greenhouse gas	*Base year[a]*	*1990*	*1995*	*2000*	*2008*	*2009*	*2010*	*2011*	*Base year–2011*
Annex A sources		CO_2	23 338.72	23 338.72	17 201.66	20 093.24	23 755.72	21 982.48	21 288.79	20 869.29	–10.6
		CH_4	3 466.48	3 466.48	2 792.76	2 782.50	3 610.99	3 598.84	3 638.97	3 581.30	3.3
		N_2O	3 940.75	3 940.75	3 054.07	3 284.97	3 569.91	3 317.47	3 371.29	3 485.11	–11.6
		HFCs	NO	NO	49.37	170.68	424.16	435.68	472.25	475.94	NA
		PFCs	936.56	936.56	NO	NO	NA, NO	0.20	0.03	0.01	–100.0
		SF_6	10.95	10.95	11.66	12.18	12.55	8.39	9.32	9.82	–10.4
KP-LULUCF	Article 3.3[b]	CO_2					317.36	259.49	232.71	180.01	
		CH_4					IE, NE, NO	IE, NE, NO	IE, NE, NO	IE, NE, NO	
		N_2O					IE, NE, NO	IE, NE, NO	IE, NE, NO	IE, NE, NO	
	Article 3.4[c]	CO_2	NA				–8 178.75	–8 420.27	–8 300.17	–7 460.68	NA
		CH_4	NA				3.83	1.91	1.32	6.82	NA
		N_2O	NA				0.88	0.44	0.30	1.56	NA

Abbreviations: IE = included elsewhere, KP-LULUCF = land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, NA = not applicable, NE = not estimated, NO = not occurring.

[a] "Base year" for Annex A sources refers to the base year under the Kyoto Protocol, which is 1990 for all gases. The "base year" for cropland management, grazing land management and revegetation under Article 3, paragraph 4, of the Kyoto Protocol is 1990. For activities under Article 3, paragraph 3, of the Kyoto Protocol and forest management under Article 3, paragraph 4, only the inventory years of the commitment period must be reported.

[b] Activities under Article 3, paragraph 3, of the Kyoto Protocol, namely afforestation and reforestation, and deforestation.

[c] Elected activities under Article 3, paragraph 4, of the Kyoto Protocol, including forest management, cropland management, grazing land management and revegetation.

Table 2
Greenhouse gas emissions by sector and activity, base year[a] to 2011

			Gg CO_2 eq							*Change (%)*
		Sector	*Base year[a]*	*1990*	*1995*	*2000*	*2008*	*2009*	*2010*	*2011*	*Base year–2011*
Annex A		Energy	22 796.49	22 796.49	17 263.04	19 482.32	22 902.63	21 650.68	21 009.15	20 715.35	–9.1
		Industrial processes	3 788.53	3 788.53	2 015.86	2 861.20	3 592.44	2 983.54	3 211.22	3 000.13	–20.8
		Solvent and other product use	116.98	116.98	108.34	109.22	239.31	152.91	152.48	144.16	23.2
		Agriculture	4 380.72	4 380.72	3 054.84	3 130.16	3 581.49	3 457.15	3 315.98	3 442.21	–21.4
		Waste	610.76	610.76	667.44	760.67	1 057.48	1 098.78	1 091.82	1 119.62	83.3
		LULUCF	NA	–6 411.22	–9 078.57	–7 719.24	–7 823.51	–8 065.64	–7 871.65	–7 031.80	NA
		Total (with LULUCF)	**NA**	**25 282.26**	**14 030.94**	**18 624.33**	**23 549.83**	**21 277.43**	**20 908.99**	**21 389.67**	**NA**
		Total (without LULUCF)	**31 693.47**	**31 693.47**	**23 109.52**	**26 343.57**	**31 373.34**	**29 343.07**	**28 780.65**	**28 421.47**	**–10.3**
		Other[b]	NA	NA	NA	NA	NA	NA	NA	NA	NA
KP-LULUCF	Article 3.3[c]	Afforestation and reforestation					–178.51	–182.37	–178.65	–191.58	
		Deforestation					495.87	441.86	411.35	371.59	
		Total (3.3)					**317.36**	**259.49**	**232.71**	**180.01**	
	Article 3.4[d]	Forest management					–8 174.04	–8 417.93	–8 298.56	–7 452.30	
		Cropland management	NA				NA	NA	NA	NA	NA
		Grazing land management	NA				NA	NA	NA	NA	NA
		Revegetation	NA				NA	NA	NA	NA	NA
		Total (3.4)	**NA**				**–8 174.04**	**–8 417.93**	**–8 298.56**	**–7 452.30**	**NA**

Abbreviations: KP-LULUCF = LULUCF emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, LULUCF = land use, land-use change and forestry, NA = not applicable.

[a] "Base year" for Annex A sources refers to the base year under the Kyoto Protocol, which is 1990 for all gases. The "base year" for cropland management, grazing land management and revegetation under Article 3, paragraph 4, of the Kyoto Protocol is 1990. For activities under Article 3, paragraph 3, of the Kyoto Protocol and forest management under Article 3, paragraph 4, only the inventory years of the commitment period must be reported.

[b] Emissions/removals reported in the sector other (sector 7) are not included in Annex A to the Kyoto Protocol and are therefore not included in national totals.

[c] Activities under Article 3, paragraph 3, of the Kyoto Protocol, namely afforestation and reforestation, and deforestation.

[d] Elected activities under Article 3, paragraph 4, of the Kyoto Protocol, including forest management, cropland management, grazing land management and revegetation.

II. Technical assessment of the annual submission

A. Overview

1. Annual submission and other sources of information

6. The 2013 annual inventory submission was submitted on 15 April 2013 and revised emission estimates were submitted on 27 May 2013; it contains a complete set of common reporting format (CRF) tables for the period 1990–2011 and an NIR. Croatia also submitted the information required under Article 7, paragraph 1, of the Kyoto Protocol, including information on: activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, accounting of Kyoto Protocol units, changes in the national system and in the national registry, and the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol. The standard electronic format (SEF) tables were submitted on 20 May 2013. The annual submission was submitted in accordance with decision 15/CMP.1.

7. Croatia officially submitted revised emission estimates on 15 November 2013 in response to the list of potential problems and further questions raised by the ERT. All values in this report are based on the revised estimates submitted on 15 November 2013.

8. The full list of materials used during the review is provided in annex II to this report.

2. Overall assessment of the inventory

9. Table 3 contains the ERT's overall assessment of the annual submission of Croatia. For recommendations for improvements related to cross-cutting issues for specific categories, please see the paragraphs cross-referenced in the table.

Table 3
The expert review team's overall assessment of the annual submission

		General findings and recommendations
The expert review team's (ERT's) findings on completeness of the 2013 annual submission		
Annex A sources[a]	Complete	Mandatory: none Non-mandatory: "NE" is reported for: CO_2 emissions from asphalt roofing and road paving with asphalt, CH_4 and N_2O emissions from other (mineral products) – glass production, CO_2 and N_2O emissions from ethylene and CO_2, CH_4 and N_2O emissions from low-density polyethene, polystyrene and propylene under other (chemical industry) and CO_2 emissions from food and drink in the industrial processes sector; degreasing and dry cleaning, N_2O emissions from fire extinguishers, other use of N_2O and other solvent use (SNAP 0604) under other in the solvent and other product use sector; and CH_4 and N_2O emissions from

		General findings and recommendations
		incineration of hazardous and hospital waste in the waste sector
Land use, land-use change[a] and forestry	Not complete	Mandatory: "NE" is reported for: the carbon stock changes in all pools except for organic soils under other land converted to forest land; CO_2 emissions from limestone application to cropland and to grassland; and CO_2, CH_4 and N_2O emissions from wildfires under cropland remaining cropland and grassland remaining grassland
		Non-mandatory: "NE" is reported for: the carbon stock changes in all pools under wetlands remaining wetlands and settlements remaining settlements; and CO_2, CH_4 and N_2O emissions from wildfires under wetlands remaining wetlands
KP-LULUCF	Not complete	Reporting on areas and related emissions and removals for forest other than state forest is missing and Croatia could not assure the ERT that capacity is available to ensure complete reporting (see paras. 81–83 below)
		"NE" is reported for: carbon stock changes in above- and below-ground biomass in the areas of 'out of yield' forest under the category forest management (see para. 63 below)
The ERT's findings on recalculations and time-series consistency in the 2013 annual submission	Generally consistent	For category-specific recommendations see paragraphs 37, 43 and 46, below
The ERT's findings on verification and quality assurance/quality control procedures in the 2013 annual submission	Sufficient	For the category-specific recommendation see paragraphs 31 and 51 below
The ERT's findings on the transparency of the 2013 annual submission	Generally sufficient	For category-specific recommendations see paragraphs 28, 36, 38, 40, 48, 65, 68 and 82 below

Abbreviations: Annex A sources = sources included in Annex A to the Kyoto Protocol, KP-LULUCF = land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, NE = not estimated.

[a] The assessment of completeness by the ERT considers only the completeness of reporting of mandatory categories (i.e. categories for which methods and default emission factors are provided in the Intergovernmental Panel on Climate Change (IPCC) *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*, or the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry*).

3. Description of the institutional arrangements for inventory preparation, including the legal and procedural arrangements for inventory planning, preparation and management

Inventory planning

10. The NIR described the national system for the preparation of the inventory. The Ministry of Environmental and Nature Protection (MENP) has overall responsibility for the national inventory. Other organizations are also involved in the preparation of the inventory. The Croatian Environmental Agency (CEA) has overall responsibility for organizing the GHG inventory preparation, including collecting activity data (AD), developing and implementing the quality assurance/quality control (QA/QC) plan, archiving the information used in the preparation of the GHG inventory and selecting the institution that prepares the inventory, which is referred to as the Authorized Institution. The Energy and Environmental Protection Institute (EKONERG) was selected as the Authorized Institution for a three-year period for the preparation of Croatia's 2013, 2014 and 2015 annual submissions.

11. EKONERG, as the Authorized Institution, is responsible for the preparation of the inventory, and its specific responsibilities include:

(a) The calculation of estimates of all anthropogenic emissions from sources, removals by sinks and indirect GHG emissions;

(b) The preparation of quantitative estimates of uncertainties;

(c) The identification of key categories;

(d) The recalculation of estimates of GHG emissions and removals in cases of the improvement of methodologies, emission factors (EFs) or AD, the inclusion of new categories, or the application of modified methods;

(e) The calculation of estimates of GHG emissions or removals for categories in the LULUCF sector;

(f) Reporting on the issuance, holding, transfer, acquisition, cancellation and retirement of emission reduction units, certified emission reduction units, assigned amount units and removal units, as well as on carry-over;

(g) The implementation of and reporting on QC procedures in line with the QA/QC plan;

(h) The preparation of the GHG inventory report;

(i) Cooperation with the ERT for the purposes of the technical review and assessment/evaluation of the national inventory.

12. Croatia provides in its NIR an overview of the cycle of QA/QC activities and the responsibilities of the three institutes referred to in paragraph 10 above, as well as an overview of the organizations responsible for providing AD, by category.

Inventory preparation

13. Table 4 contains the ERT's assessment of Croatia's inventory preparation process.

Table 4
Assessment of inventory preparation by Croatia

		General findings and recommendations
Key category analysis		
Was the key category analysis performed in accordance with the Intergovernmental Panel on Climate Change (IPCC) *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance) and the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF)?	Yes	
Approach followed?	Both tier 1 and tier 2	
Were additional key categories identified using a qualitative approach?	No	
Has Croatia identified key categories for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol following the guidance on establishing the relationship between the activities under the Kyoto Protocol and the associated key categories in the UNFCCC inventory?	Yes	Forest management is a key category for elected activities under Article 3, paragraphs 3 and 4, while forest land remaining forest land (level for 2011), land converted to settlements (level and trend for 2011), land converted to forest land (level for 1990 and trend for 2011) and cropland remaining cropland (trend for 2011) are key categories in the LULUCF sector
Does Croatia use the key category analysis to prioritize inventory improvements?	Yes	Croatia reports that the key category analysis is used to drive inventory improvements, but no details are provided on how it is used to prioritize the development and improvement of the inventory, including methodological choices. The ERT recommends that Croatia include more information thereon in the NIR
Are there any changes to the key category analysis in the latest submission?	No	
Assessment of uncertainty analysis		
Approach followed?	Both tier 1 and tier 2	

	General findings and recommendations
Was the uncertainty analysis carried out in accordance with the IPCC good practice guidance and the IPCC good practice guidance for LULUCF?	Yes
Quantitative uncertainty (including LULUCF) (tier 1)	Level = 31.1% Trend = 36.3%
Quantitative uncertainty (excluding LULUCF) (tier 1)	Level = 13.1% Trend = 19.4%

Abbreviations: ERT = expert review team, LULUCF = land use, land-use change and forestry, NIR = national inventory report.

Inventory management

14. Croatia has a centralized archiving system, which includes the archiving of disaggregated EFs and AD, nd documentation on how these factors and data have been generated and aggregated for the preparation of the inventory. The archived information also includes internal documentation on QA/QC procedures, external and internal reviews, and documentation on annual key categories and key category identification and planned inventory improvements.

15. According to Article 8, paragraph 1 of the Regulation on the Monitoring of Greenhouse Gas Emissions, Policies and Mitigation Measures in the Republic of Croatia, within the competence of CEA is the preparation of the QA/QC plan, the implementation of the QA procedures in accordance with the QA/QC plan and the archiving of the AD and EFs used for emission estimation and the documents used for planning, preparing, controlling and assuring inventory quality.

16. While the emission estimates are calculated by the Authorized Institution, CEA is in possession of and responsible for archiving the following documentation: input AD and AD collection methodologies; and inventory data record sheet (IDRS) tables, which contain sources of AD and EFs, methodologies used, references and some additional information. Examples of IDRS are included in annex 6 to the NIR.

17. Croatia had difficulty responding to the requests made by the ERT in a timely manner. The responses to questions that the ERT sent to Croatia during the review week were delayed and provided on the fourth or fifth day of the review week. The ERT notes and appreciates that towards the end of the review week Croatia improved its response time and provided the ERT with the requested information. However, the significant delay in responding to the ERT's questions created significant difficulties for the ERT in performing the review in a complete and timely manner, not only in relation to the review of Croatia's inventory, but also in relation to all reporting Parties whose submissions were being reviewed by the same ERT in the same week. The ERT recommends that Croatia ensure that its inventory management system functions in such a way as to allow the p ovision of timely responses to the ERT.

4. Follow-up to previous reviews

18. Croatia provides in its NIR an overview table showing whether the recommendations made in previous review reports were taken into consideration in the preparation of its 2013 annual submission and/or will be taken into consideration in time for its next or future annual submissions. The ERT commends Croatia for the overview, but

recommends that the Party improve transparency by providing in the table references to specific sections of the NIR (e.g. paragraph numbers) to indicate where such recommendations are covered. The ERT also commends Croatia for the implementation of a number of recommendations made in previous review reports (see para. 20 below) and looks forward to the implementation of the recommendations planned for the next annual submission.

19. The recommendations made in the previous review report that were implemented in the preparation of the Party's 2013 annual submission include:

(a) The exclusion of emissions from coke oven gas production from the reference approach. Croatia documented the methodology used for the recalculations of reference approach in its NIR;

(b) The provision of more information on AD for ferroalloys production; the clarification that there is no production of HFCs, PFCs or SF_6 in the country; the use of non-adjusted AD for cement production; the use of the correct notation key (included elsewhere ("IE")) to report CO_2 emissions from glass production and the provision of an explanation in CRF table 9(a); the provision of a clear distinction, in both the CRF tables and the NIR, between the energy and industrial processes sectors with regard to fuel and feedstock issues; the transparent documentation of the methodology used to estimate emissions from foam blowing; and the completion of the CRF sectoral background table for emissions from foam blowing (see paras. 28 and 42 below);

(c) The improvement of the documentation on several topics in relation to the agriculture sector. The NIR now includes: information on the annual average nitrogen excretion (Nex) rate for livestock and the fractions of Nex that are managed for each animal waste management system (AWMS) for each animal type, as well as the sources of that information; the reasons for the choice of parameters for different subcategories (e.g. numbers of goats, mules and asses, and crop production levels of cowpeas, lentils, peas and vetches); an explanation of how time-series consistency for categories is ensured; information on the nitrogen (N) content of N-fixing crops and additional explanations on the data and information sources used for the parameters for non-N-fixing crops; the logical basis for expert judgements, such as in relation to the area of organic soils and the uncertainty of AD; and explanations for activities that are not occurring (see paras. 49 and 50 below);

(d) The estimation of the area of land converted to settlements on the basis of the expert judgement that settlements originate from forest land, grassland and cropland (see para. 73 below);

(e) The use of the correct notation key to report emissions from wastewater sludge;

(f) The inclusion of private and 'other state' forests to improve the forest types to estimate deforestation (see para. 83 below).

20. The recommendations made in the previous review report that Croatia plans to implement in the preparation of its next annual submission or in the longer term include:

(a) The provision of detailed information on how the key category analysis is used to prioritize the development and improvement of the inventory, including methodological choices, particularly for the energy sector;

(b) The examination of the reasons for the discrepancies between the data submitted to the International Energy Agency (IEA) and the data reported in the CRF tables (see para. 26 below);

(c) The provision of a description of the approach used to derive the estimate of international and domestic fuel consumption for navigation (see para. 27 below);

(d) The use of country- and plant-specific CO_2 EFs for all of the stationary combustion subcategories (see para. 29 below);

(e) The application of a higher-tier method to estimate fugitive CH_4 emissions from transmission and distribution of natural gas (see para. 33 below);

(f) The provision of more general information on the survey of the ammonia manufacturers that provide data and the approach used for the split between natural gas used as fuel and natural gas used as feedstock (see para. 38 below);

(g) The improvement of the documentation included in the inventory for the agriculture sector by providing background information on the evaluation of AD, information on the data sources and representativeness of the yearly average milk yields, and clear references to equations, parameters and EFs (see para. 48 below).

5. Areas for further improvement identified by the expert review team

21. During the review, the ERT identified a number of areas for improvement, including some related to specific categories. These are listed in the relevant chapters of this report and in table 8.

B. Energy

1. Sector overview

22. The energy sector is the main sector in the GHG inventory of Croatia. In 2011, emissions from the energy sector amounted to 20,715.35 Gg CO_2 eq, or 72.9 per cent of total GHG emissions. Since 1990, emissions have decreased by 9.1 per cent. The key drivers for the fall in emissions are the decreases in emissions from manufacturing industries and construction (a decrease of 46.3 per cent since the base year) and energy industries (a decrease of 12.2 per cent since the base year). Emissions from transport have increased by 43.8 per cent since the base year. Within the sector, 30.3 per cent of the emissions were from energy industries, followed by 28.4 per cent from transport, 16.4 per cent from other sectors and 15.2 per cent from manufacturing industries and construction. Fugitive emissions from oil and natural gas accounted for 9.7 per cent.

2. Reference and sectoral approaches

23. Table 5 provides a review of the information reported under the reference approach and the sectoral approach, as well as comparisons with other sources of international data. Issues identified in table 5 are more fully elaborated in paragraphs 24–28 below.

Table 5
Review of reference and sectoral approaches

		Paragraph cross-references
Difference between the reference approach and the sectoral approach	Energy consumption: 1.57 PJ, 0.59% CO_2 emissions: 429.30 Gg CO_2 eq, 2.32%	24
Are differences between the reference approach and the sectoral approach adequately explained in the NIR and the CRF tables?	No	24

		Paragraph cross-references
Are differences with international statistics adequately explained?	No	25, 26
Is reporting of bunker fuels in accordance with the UNFCCC reporting guidelines?	Yes	26, 27
Is reporting of feedstocks and non-energy use of fuels in accordance with the UNFCCC reporting guidelines?	No	28

Abbreviations: CRF = common reporting format, NIR = national inventory report, UNFCCC reporting guidelines = "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories".

Comparison of the reference approach with the sectoral approach and international statistics

24. Croatia attributes the difference between the reference and sectoral approaches to the amounts of fuel used as feedstock and for non-energy consumption, which are not accounted for under the sectoral approach. However, the reference approach takes this into account in CRF table 1.A(c) for the comparison of CO_2 emissions from fuel combustion under the heading "Apparent energy consumption (excluding non-energy use and feedstocks)". For gaseous fuels in 2011 there is effectively 9.28 PJ assigned to feedstocks, which is consistent with CRF table 1.A(d) for feedstocks and non-energy use of fuels, where 9.28 PJ is attributed to ammonia production. This issue has already been pointed out in previous review reports. Therefore, the ERT reiterates the recommendation made in the previous review report that Croatia provide a more detailed explanation of the difference between the estimates of CO_2 emissions calculated using the sectoral approach and those calculated using the reference approach and include a brief explanation in the documentation box of CRF table 1.A(c). The disparity is above 2 per cent for most years of the time series, the greatest inconsistency being for gaseous fuels, for which there has been a difference of about 10 per cent every year since 1990. The ERT recommends that Croatia report details including the quantifiable information of an analysis of the fuels behind the discrepancy.

25. Numerous issues identified in previous review reports concerning discrepancies between the data submitted to IEA and the data reported in the CRF tables have not been resolved. For example, in comparison with IEA data, the production of liquid fossil fuels reported in the CRF tables is systematically lower by 4–20 per cent. In addition, in CRF table 1.A(b), natural gas liquids are reported as "IE" and are largely aggregated with crude oil and to some extent with natural gas, but data thereon are available separately in the IEA data. Further, imports of sub-bituminous coal and lignite reported in the CRF tables appear to all be classified as lignite in the IEA data (except for 2010). Exports (and in some cases imports) of crude oil show differences prior to 1997 between the two data sets. The ERT reiterates the recommendation made in previous review reports that Croatia examine the reasons for the discrepancies and explain the results of its investigations in the NIR.

International bunker fuels

26. Croatia includes in its NIR a brief account of how data on international and domestic fuel consumption for navigation are derived. The ERT notes that, for international aviation, the level of fuel consumption reported is systematically higher than the level according to the IEA data. The discrepancies between CRF table 1.C and IEA data are related to the fact that a larger part of jet kerosene consumption is reported as international aviation in the

CRF table. The ERT also notes that Croatia explains in its NIR that the improvement of the description of the approach used to derive the estimate of international and domestic fuel consumption for navigation, as recommended in the previous review report, is planned to be implemented for its next annual submission. In response to previous review stages in 2013, Croatia explained its plan to further explore the difference between the data reported in the CRF tables and the IEA data in coordination with the Ministry of Economy, the Croatian Bureau of Statistics (CBS) and the Energy Institute Hrvoje Požar. The ERT commends Croatia for this plan and recommends that the Party implement the plan and reflect the results in its NIR.

27. Croatia reports high inter-annual variation in the estimated CO_2 emissions from international navigation. This issue was already raised in the previous review report. Croatia has explained that the changes in the level of emissions follow the consumption pattern from the energy balance. Croatia reports in its NIR (page 32) a fuel consumption for marine bunkers in 2011 that is 3.5 times higher than that in 2010 (0.25 PJ in 2010 and 0.98 PJ in 2011). The ERT recommends that Croatia provide a more detailed explanation of the drivers underlying the variation in the NIR.

Feedstocks and non-energy use of fuels

28. Croatia provides information on the division between natural gas used as fuel and natural gas used as feedstock for ammonia production (NIR, pages 34 and 98, and CRF table 1.A(d)). However, in the light of the large discrepancy for gaseous fuels between the reference approach and the sectoral approach (see para. 24 above), the ERT considers that the allocation of feedstocks and non-energy use of fuels reported by the Party lacks transparency. This is also the case for refinery feedstocks, which are reported separately in the IEA data but are included with other oil in the CRF tables. The ERT recommends that Croatia improve the transparency of its reporting by providing more detail on feedstocks and non-energy use of fuels in the NIR.

3. Key categories

Stationary combustion: solid, liquid and gaseous fuels – CO_2

29. Croatia reports in its NIR that the estimates of emissions from thermal power plants and public cogeneration plants for the period from 1990 to 2011 were calculated using a more detailed tier 2 approach that is based on plant-specific fuel consumption data for public electricity and heat production. However, Croatia continues to use default EFs, default carbon content values and oxidation factors to calculate its CO_2 emission estimates. In the NIR Croatia states that it is planning to use country- and plant-specific CO_2 EFs for all of the stationary combustion subcategories, but it does not provide a time frame for implementation. The ERT commends Croatia for its plan to improve its emission estimates but reiterates the recommendation made in the previous review report that Croatia apply country-specific factors to estimate emissions for the main fuel types. Where country-specific factors are not available, the ERT suggests that Croatia provide an implementation timeline for this recommendation in the NIR.

Road transportation: liquid and gaseous fuels – CO_2

30. In response to the recommendations made in previous review reports, Croatia used a tier 1 method for estimating CO_2 emissions from liquid fuels (gasoline and diesel) used for road transportation. However, to estimate CO_2 emissions from gaseous fuels (liquefied petroleum gas and compressed natural gas) used for road transportation, Croatia still uses the COPERT IV model. Noting that, according to the Intergovernmental Panel on Climate Change (IPCC) *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance),

CO_2 emissions from road transportation are best calculated on the basis of the amount and type of fuel combusted and its carbon content, the ERT strongly recommends that Croatia use a tier 1 approach to estimate CO_2 emissions from road transportation for all fuels.

Coal mining and handling: solid fuels – CH_4

31. Coal mining ceased in Croatia in 1999 and emissions from the activity have been reported for the period 1990–1999, calculated using a tier 1 method. For the period between 2000 and 2011 emissions are reported as not occurring ("NO"). In previous review reports Croatia was recommended to revise the calculation of fugitive emissions from coal mining and handling since the Party used data on saleable coal production from the energy balance, which is not in accordance with the IPCC good practice guidance, which requires the use of raw coal production data. In its NIR (page 70) Croatia mentions its plan to revise the calculation of fugitive emissions from coal mining, provide sources for the EFs used and improve the relevant QA/QC procedures, in order to respond to the recommendation made in previous review reports. However, no further explanation is provided in the NIR. The ERT recommends that Croatia revise the estimates of CH_4 emissions for this category and clearly document the revision in its NIR, including the AD used and the sources of the EFs used, as well as improve the relevant QA/QC procedures, so that the matter is fully resolved.

Oil and natural gas: liquid and gaseous fuels – CO_2, CH_4 and N_2O[3]

32. For both oil and natural gas, Croatia reports emissions from flaring as "IE" and reports aggregated emissions from venting and flaring under the category of venting. Previous review reports have recommended that Croatia estimate emissions for each stage of oil and gas operations (production, unloading, processing, underground storage, transportation and distribution). In response to a question raised by the ERT during the review, Croatia confirmed that subcategory-specific data were not readily available for the 2013 annual submission. The ERT recommends that Croatia take steps towards resolving this issue and describe the progress made in this regard in its NIR.

33. Fugitive CH_4 emissions from natural gas transmission and distribution have been reported as "IE". In response to a question raised by the ERT during the review, Croatia confirmed that the emissions are included under production/processing. Croatia also confirmed that CH_4 emissions from transmission and distribution will be reported separately in its next annual submission. The ERT commends Croatia for its plan to resolve this issue. In the previous review report it was noted that, according to the IPCC good practice guidance, fugitive emissions from gas transmission and distribution systems do not correlate well with throughput and are better related to lengths of pipeline. The ERT reiterates the recommendation made in the previous review report that Croatia estimate emissions for this category using a higher-tier method in order to improve the comparability of its reporting.

4. Non-key categories

Other (mobile): liquid fuels – CO_2, CH_4 and N_2O

34. Previous review reports have recommended that Croatia use the correct notation key for the reporting of mobile emissions from military fuel use and provide a clear explanation

[3] Not all emissions related to all gases under this category are key categories, particularly CO_2 and N_2O emissions. However, since the calculation procedures for issues related to this category are discussed as a whole, the individual gases are not assessed in separate sections.

of where the emissions are allocated. The present ERT notes that, in the CRF tables, Croatia has reported emissions from mobile sources under the category other (fuel combustion) as "NO". The table of planned improvements provided in the NIR (page 308) shows that the issue of the reporting on military fuel combustion will be addressed in the next annual submission. The ERT recommends that Croatia report military fuel combustion under other (fuel combustion) and, if data are not available, that the Party use the notation key "IE" to report the emissions, with a footnote indicating where the emissions are included, in accordance with the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines).

C. Industrial processes and solvent and other product use

1. Sector overview

35. In 2011, emissions from the industrial processes sector amounted to 3,000.13 Gg CO_2 eq, or 10.6 per cent of total GHG emissions, and emissions from the solvent and other product use sector amounted to 144.16 Gg CO_2 eq, or 0.5 per cent of total GHG emissions. Since 1990, emissions have decreased by 20.8 per cent in the industrial processes sector, and increased by 23.2 per cent in the solvent and other product use sector. The key driver for the fall in emissions in the industrial processes sector is the decrease in emissions from metal industry (by 97.5 per cent since the base year) because of the halting of production of pig iron and aluminium in 1999 and ferroalloys in 2003. On the other hand, there is an increasing trend in the emissions from consumption of halocarbons and SF_6 (by 4,334.5 per cent since the base year). Within the industrial processes sector, 42.7 per cent of the emissions were from chemical industry, followed by 40.2 per cent from mineral products, 16.2 per cent from consumption of halocarbons and SF_6 and 1.0 per cent from metal industry.

36. Detailed information on recalculations is missing for some categories (e.g. chemical industry), while additional information would improve the transparency and completeness of the CRF tables (e.g. more descriptive information on AD in related sectoral background CRF tables, such as CRF table2(I).A-G). The ERT recommends that Croatia continue to improve the documentation of the information on recalculations.

37. Croatia reports in its NIR (page 310) that it plans, as recommended in the previous review report, to refine the AD used for all categories by conducting more thorough checks against international statistics, general economic trends and domestic regulation changes, such as bans on the use of certain equipment that may affect trends, for its next annual submission. The ERT looks forwards to seeing the results of such actions and recommends that the Party implement the results in its inventory of the industrial processes sector.

2. Key categories

Ammonia production – CO_2

38. Croatia reports in its NIR (page 98) that emissions of CO_2 from natural gas used as fuel are presented under the energy sector. But, for the energy sector, Croatia provides on page 34 of the NIR an explanation of the split between natural gas used for fuel and natural gas used for feedstock (based on the approach that natural gas which is used as fuel in ammonia production is defined as the difference between the data on non-energy use of natural gas in the energy balance and the data on the consumption of natural gas used as a feedstock collected through the survey of ammonia manufacturers). The ERT recommends that Croatia improve transparency by providing more detailed and specific explanation with regard to the approach used for the split between natural gas used as fuel and natural gas used as feedstock in the NIR.

39. Croatia's CO_2 implied emission factors (IEFs) for ammonia production are 1.06–1.35 t/t, which is among the lowest compared with those of the other Parties that report these emissions, (0.80–2.44 t/t) and which is lower than the IPCC default EF (1.5–1.6 t/t). The previous review report recommended that Croatia provide more information together with the approach used to split natural gas between that used as fuel and that used as feedstock, as described in paragraph 38 above. Croatia indicated, in response to a question raised by the ERT during the current review, that the composition of natural gas is the reason for the low CO_2 IEF because natural gas is the main feedstock for ammonia production. It also explained that there is no short-term plan to use a higher-tier method, but a long-term plan for improvements could be taken into consideration in the next annual submission. The ERT strongly recommends that Croatia review its emission estimation methodology for this category and provide clearer justification of its IEF estimation in it next annual submission.

Ferroalloys production – CO_2

40. Croatia states in its NIR that information on the quantity of reducing agent used was collected from a statistical database (inputs of raw material in industrial production) and an interpolation method was used for the calculation of missing data on the production of coke from coal for the periods 1994–1996 and 1999–2001. Since this is a key category, the ERT recommends that Croatia provide more details on its plan to increase the transparency and accuracy of its estimates by obtaining AD for ferroalloys production to replace the interpolated data.

Consumption of halocarbons and SF_6 – HFCs, PFCs and SF_6[4]

41. Croatia states in its NIR that there are currently no available data on the decommissioning and disposal of refrigeration and air-conditioning equipment, but presumably there are individual cases of the disposal of such equipment. In response to a question raised by the ERT during the review, Croatia explained that the Government contacted the biggest companies dealing with air-conditioning and refrigeration equipment and they confirmed that there is still no need for the decommissioning and disposal of the mentioned equipment. The ERT recommends that Croatia continue to conduct surveys on the status of disposal of refrigeration and air-conditioning equipment and include the results in its NIR.

42. Croatia states in its NIR (page 294) that actual emissions of HFC-152a used in foam blowing could not be calculated due to the lack of data on average annual stocks. Following a recommendation made in the previous review report, Croatia used the values for potential emissions to re-estimate the emissions of HFC-152a for the period 2006–2010. The ERT commends Croatia for the improvement and recommends that the Party further improve its reporting for this subcategory by conducting the necessary surveys to obtain the missing AD on actual emissions for the entire time series.

43. The ERT noted that the total consumption of halocarbons and SF_6 is reported under the category total potential emissions of halocarbons and SF_6 in bulk (import). In response to a question raised by the ERT during the review, Croatia informed the ERT that the calculation of potential HFC emissions was performed using data on the total consumption of HFC gases, obtained by MENP, and that, for now, the data are in an aggregated form and therefore aggregated data are reported under the category total potential emissions of

[4] Not all emissions related to all gases under this category are key categories, particularly PFC and SF_6 emissions. However, since the calculation procedures for issues related tc this category are discussed as a whole, the individual gases are not assessed in separate sections.

halocarbons and SF_6 in bulk (import). The ERT recommends that Croatia continue its effort to report emissions from import and export separately in future inventory submissions.

3. Non-key categories

Other (solvent and other product use) – N_2O

44. Croatia reports N_2O emissions from fire extinguishers and solvent and other product use as not estimated ("NE") because of data unavailability. Although questions were raised by the ERT, no information including a plan to collect AD to complete the emission estimations for those subcategories was provided to the ERT. The ERT recommends that Croatia either provide clear information to justify that N_2O emission from fire extinguishers and other activities do not occur (in which case change the notation key from "NE" to "NO") or conduct the necessary surveys and report emissions accordingly in the annual submission.

D. Agriculture

1. Sector overview

45. In 2011, emissions from the agriculture sector amounted to 3,442.21 Gg CO_2 eq, or 12.1 per cent of total GHG emissions. Since 1990, emissions have decreased by 21.4 per cent. The key driver for the fall in emissions is the reduction in the livestock population due to the war in the early 1990s and the economic and political transition to a market economy in the country. Within the sector, 63.9 per cent of the emissions were from agricultural soils, followed by 23.4 per cent from enteric fermentation and 12.8 per cent from manure management. Rice cultivation, prescribed burning of savannas and field burning of agricultural residues are reported as "NO" in Croatia.

46. Croatia applies tier 1 methods for the estimation of CH_4 emissions from enteric fermentation for all animals except for cattle and uses the default EFs for developing countries for the years 1990–2007 and the default EFs for developed countries for the years 2008–2011. For the estimation of CH_4 and N_2O emissions from manure management, Croatia applies tier 1 methods using default EFs for developing countries for the years 1990–2007 and default EFs for developed countries for the years 2008–2011 for sheep, goats, horses, mules/asses, and poultry. This issue was raised during the previous review and in the 2012 review report Croatia was recommended to apply, for its next annual submission, the EFs for developed countries for all years of the time series in accordance with the IPCC good practice guidance. In response to a question raised by the ERT during the current review, Croatia explained that the use of the IPCC default EFs is a short-term improvement prior to the development of country-specific EFs, and confirmed that it will use the EFs for developed countries for the entire time series for its next annual submission. The ERT recommends that Croatia implement this short-term improvement in its next annual submission and continue its effort to develop country-specific EFs to estimate CH_4 emissions from enteric fermentation and CH_4 and N_2O emissions from manure management.

47. Croatia uses the notation key "NO" for the reporting of CH_4 emissions from agricultural soils in CRF table 4. However, for activities in a given category that do not result in emissions or removals of a specific gas, the ERT is of the view that the notation key "NA" (not applicable) is more appropriate. The ERT recommends that Croatia report the notation key "NA" instead of "NE" for parameters not applied in the calculations when using a tier 1 method. In order to be consistent with the reporting of the other relevant animal categories, the ERT also recommends Croatia use, in CRF table 4.B(a) for AWMS, the notation key "NA" instead of "NE" for the animal category mature dairy cattle.

48. As identified in previous review reports, there is room for further improvement of the transparency of the inventory for the agriculture sector. Noting that Croatia has addressed a number of the recommendations made in the previous review reports, the ERT reiterates the following outstanding recommendations: to include in the NIR, background information on the evaluation of AD compiled by CBS and the Croatian Horse Breeding Centre; information on how time-series consistency is ensured if different sources of data have been chosen; data sources for and information on the representativeness of the yearly average milk yields; and clear references to equations, parameters and EFs in order to improve transparency of documentation in the agriculture sector inventory.

49. The ERT commends Croatia for starting two projects to develop tier 2 estimates with country-specific EFs and AWMS distribution for the estimation of CH_4 emissions from enteric fermentation (cattle) and CH_4 and N_2O emissions from manure management (cattle and swine) and recommends that Croatia apply the new study results for emission calculations as soon as they are available.

50. The ERT commends Croatia for reporting crop production data in CRF table 4.F, field burning of agricultural residues for crops included under CRF table 4.D, in response to the recommendation made in the previous review report. However, some information is still missing. The ERT recommends that Croatia report all relevant parameters and fractions related to the AD and the calculation of N_2O emissions from N-fixing crops and crop residues in CRF table 4.F.

2. Key categories

Enteric fermentation – CH_4

51. In the additional information to CRF table 4.A for 2011, a milk yield of 4,249.00 kg/day is reported for mature dairy cattle. However, that value could not be reproduced by the ERT. In response to a question raised by the ERT during the review, Croatia explained that the value of 4,249.00 kg reported for 2011 is the statistical value of the total yearly milk production per cow in litres, which was erroneously entered into the CRF table in place of the appropriate calculated value (in kg/day). The correct values are 12.05 kg/day and 4,397.72 kg/year, and these were included in the revised emissions estimates submitted by Croatia on 15 November 2013. The input error did not affect the actual emission calculation since the correct value was used in the emission calculation. The ERT recommends that Croatia improve its sector-specific routine QC procedures, especially at the stage of data transfer from the calculation sheet to the CRF tables.

52. In its estimation of CH_4 emissions for cattle, using a tier 2 method, Croatia uses default values for cattle live weights and also for milk fat percentages, although the Party does have corresponding country-specific data. This issue was already pointed out in the previous review report; however, default values have still been used for the 2013 annual submission. In response to a question raised by the ERT for Croatia to provide the reason why it does not use the available country-specific data for those factors, as recommended in the previous review report, Croatia explained that the timetable for the data collecting programme for the inventory did not allow the required AD to be requested in time for the 2013 annual submission. The necessary AD (national data on animal weights and milk fat percentages) for the improvement have been requested via the data requisition form for the next annual submission and the improvement is listed in the 2013 NIR (chapter 10.3, page 313) as an improvement for implementation in the 2014 annual submission. During the review, Croatia explained that the results are delayed and foreseen to be used for the preparation of 2015 annual submission. The ERT recommends that Croatia update its list of sector-specific improvements and implement the improvement on schedule.

Manure management – CH_4 and N_2O

53. Croatia used a tier 1 method together with IPCC default EFs to estimate CH_4 emissions from manure management for mature dairy cattle. It selected the default EF of 6 kg CH_4/head/year (Revised 1996 IPCC Guidelines, page 4.43, table B-3) for dairy cattle. That default EF is based on an average annual milk production of 2,550 kg/head/year (Revised 1996 IPCC Guidelines, page 4.11, table 4-4) or a daily milk production of 7.0 kg/day (Revised 1996 IPCC Guidelines, p.4.31, table A-1). However, the ERT considers that the chosen default EF does not match the actual level of daily milk production as reported for enteric fermentation (mature dairy cattle) (12.05 kg/day and 4,397.72 kg/year) (see para. 51 above) and therefore is not in accordance with the IPCC good practice guidance. The ERT notes that the Revised 1996 IPCC Guidelines, in p.4.99, table 4-20, provide a range of indicative default values, while two other tables in the Revised 1996 IPCC Guidelines (page. 4.11, table 4-4 for annual milk production and page.4.31, table A-1 for a daily milk production) provide information on the underlying milk production. In response to a question raised by the ERT during the review, Croatia informed the ERT that preparations have been undertaken for starting two projects with a view to applying a tier 2 method with country-specific EFs and AWMS distribution (see para. 49 above). The ERT recommends that Croatia apply a tier 2 method in its CH_4 emission estimates in the 2015 annual submission reflecting the result of the new projects as Croatia announced during the review.

54. Noting that the average daily milk yield of dairy cows in Croatia has been increasing since 1990 and reached 12.05 kg/day in 2011, the ERT considered that there has been a potential underestimation of emissions when using the low default EF of 6 kg CH_4/head/year for dairy cattle for the entire time series (see para. 53 above). Therefore, until new country-specific values are available from the new studies mentioned in paragraph 53 above, a more appropriate default EF would be in line with the actual level of milk production reported under the category enteric fermentation (mature dairy cattle). Therefore, the ERT concluded that Croatia could be underestimating emissions and included this issue in the list of potential problems and further questions raised by the ERT. In response to the list of potential problems and further questions raised by the ERT, Croatia submitted revised estimates of CH_4 emissions from manure management, calculated using the default tier 1 EF of 14 kg CH_4/head/year for dairy cattle from the Revised 1996 IPCC Guidelines (page 4.43, table B-3) for 2006 onwards (this is the default EF related to milk production of 11.5 kg/day). The selection of 2006 was based on the AD for the years between 1990 and 2011 presented in the NIR (table 6.2-5) and the average daily milk production of 9.25 kg/day (the average of 7.0 kg/day and 11.5 kg/day in table A-1 of the Revised 1996 IPCC Guidelines). The ERT considers that the revised estimates resolved the issue and recommends that Croatia continue its efforts to develop country-specific values for the estimation of CH_4 emissions from manure management and apply the new study results for emission calculations in its 2015 annual submission as announced in an answer to a question raised by the ERT during the review (see paras. 49 and 53 above).

55. To estimate N_2O emissions from manure management for dairy cattle, Croatia used the default method provided in the IPCC good practice guidance and the tentative default Nex value of 70 kg N/head/year (Revised 1996 IPCC Guidelines, page 4.99, table 4-20), although this category was identified as a key category for level and trend. In response to a question raised by the ERT during the review, Croatia informed the ERT that preparations have been undertaken for starting two projects to develop country-specific EFs and AWMS distribution (see para. 49 above). The ERT recommends that Croatia start the work as soon as possible in order to include the refined estimates based on country-specific Nex values and AWMS data in the 2015 annual submission as announced during the review.

56. However, the ERT noted that the use of the default Nex value of 70 kg N/head/year does not reflect the present situation in Croatia. The selected default value is based on an average annual milk production of 2,550 kg/head/year (Revised 1996 IPCC Guidelines, page 4.11, table 4-4) or a daily milk production of 7.0 kg/day (Revised 1996 IPCC Guidelines, page 4.31, table A-1), which is not in line with the IPCC good practice guidance and potentially leads to an underestimation of emissions. A more appropriate default Nex for dairy cattle for Croatia would be based on the level of milk production in Croatia (12.05 kg/day in 2011). Therefore, the ERT concluded that Croatia could be underestimating emissions and included this issue in the list of potential problems and further questions raised by the ERT. In response to the list of potential problems and further questions raised by the ERT, Croatia submitted revised estimates of N_2O emissions from manure management, calculated using the default value of 100 kg Nex/head/year (from the Revised 1996 IPCC Guidelines, page 4.99, table 4-20) for 2006 onwards (100 kg Nex/head/year is the default value related to milk production of 11.5 kg/day). The selection of 2006 is based on the AD for the years between 1990 and 2011 presented in the NIR (table 6.2-5) and the average daily milk production of 9.25 kg/day (the average of 7.0 kg/day and 11.5 kg/day in table A-1 of the Revised 1996 IPCC Guidelines). The ERT considers that the revised estimates resolved the issue and recommends that Croatia revise its calculation using country-specific data as soon as new study results (see para. 54) are available.

57. The amount of N resulting from the multiplication of the swine population by the Nex value per swine reported in CRF table 4.B(b) is not equal to the sum of the reported N excreted in all AWMS (24,668,120.00 kg vs. 24,914,801.20 kg for 2011). This inconsistency was found for all reported years. In response to a question raised by the ERT during the review, Croatia explained that the correct value for 2011 is 24,668,120.00 kg, and that the fractions of manure N per AWMS which are presented in the NIR (page 159, table 6.4-1) for swine are not correct, because the sum of the fractions for liquid systems (29 per cent), pasture, range and paddock (27 per cent) and other systems (45 per cent) is 101 per cent. Owing to the incorrect distribution, the sum of the calculated values for Nex per AWMS (kg N/year) is higher than the correct total value. The ERT recommends that Croatia correct this inconsistency, as it announced that it would do during the review.

Agricultural soils – N_2O

58. To estimate direct N_2O emissions from agricultural soils, Croatia used a tier 1a approach and default EFs. The annual amount of animal manure N applied to soils was estimated by determining the total amount of animal manure N produced annually. As explained in paragraph 56 above, during the review the ERT identified that the default Nex values for dairy cattle used for estimating N_2O emissions from manure management by Croatia were not in line with the IPCC good practice guidance and potentially led to an underestimation of direct N_2O emissions from agricultural soils. Therefore, the ERT included this issue in the list of potential problems and further questions raised by the ERT. In response to the list of potential problems and further questions raised by the ERT, Croatia submitted revised estimates of N_2O emissions from animal manure applied to soils, calculated on the basis of revised amounts of animal manure N applied to soils, under the category manure management for mature dairy cattle (option B). The ERT considers that the revised estimates resolved the issue.

59. To estimate N_2O emissions from pasture, range and paddock manure, Croatia used the default method and the default EF for pasture, range and paddock manure provided in the IPCC good practice guidance. The annual amount of manure N deposited directly on soils by livestock was estimated by determining the total amount of animal manure N excreted annually on pastures. As explained in paragraph 56 above, during the review the ERT identified that the choice of default Nex values for dairy cattle for the category N_2O

emissions from manure management was not in line with the IPCC good practice guidance and that the issue potentially led to an underestimation of N_2O emissions from pasture, range and paddock manure. Therefore the ERT included this issue in the list of potential problems and further questions raised by the ERT. In response to the list of potential problems and further questions raised by the ERT, Croatia submitted revised estimates of N_2O emissions from pasture, range and paddock manure, calculated on the basis of revised amounts of manure N excreted annually on pasture, range and paddock, under the category manure management for mature dairy cattle (option B). The ERT considers that the revised estimates resolved the issue.

60. To estimate indirect N_2O emissions, Croatia used the tier 1a approach and default EFs provided in the IPCC good practice guidance. The annual amount of animal manure N excreted was estimated by multiplying the annual average Nex/head of species by the number of heads of livestock species. As explained in paragraph 56 above, the ERT identified that the choice of default Nex values for dairy cattle for the category N_2O emissions from manure management was not in line with the IPCC good practice guidance and that the issue potentially led to an underestimation of indirect N_2O emissions. Therefore, the ERT included this issue in the list of potential problems and further questions raised by the ERT. In response to the list of potential problems and further issues raised by the ERT, Croatia submitted revised estimates of indirect N_2O emissions, calculated on the basis of revised amounts of animal manure, under the category manure management for mature dairy cattle (option B). The ERT considers that the revised estimates resolved the issue.

61. Croatia reports N_2O emissions from the application of sewage sludge to agricultural land for 2005 onwards. In response to a question raised by the ERT during the review regarding the barriers to gathering data for years prior to 2005, Croatia explained that the Ordinance on management of sewage sludge when used in agriculture was adopted in 2008 and that no data are available in Croatia for before that. In response to a question regarding domestic septic tanks and the potential occurrence of slurry discharge on agricultural land, Croatia explained that municipal companies or authorized transport companies release the content from domestic septic tanks into the public sewage system at permitted locations. The discharge on agricultural land (spreading) is not common practice in Croatia. The ERT recommends that Croatia include additional relevant explanations, as provided to the ERT during the review, in the NIR.

E. Land use, land-use change and forestry

1. Sector overview

62. In 2011, net removals from the LULUCF sector amounted to 7,031.80 Gg CO_2 eq. Since 1990, net removals have increased by 9.7 per cent. The key driver for the rise in removals is the increase in removals from forest land remaining forest land following the re-establishment of forest management in areas affected by the war in Croatia. Within the sector, 7,629.10 Gg of net removals were from forest land, followed by 125.67 Gg from grassland. There were net emissions of 602.58 Gg from settlements, 103.08 Gg from cropland and 17.32 Gg from wetlands.

63. Croatia has made improvements to the completeness of the inventory for the LULUCF sector, including applying the same approach to calculate carbon gains in forests regardless of forest ownership type, following the recommendation made in the previous review report. Country-specific values are employed for wood densities, which are based on nationally conducted scientific investigations, and the dry combustion method for determining soil carbon content has been introduced instead of the previously used, less accurate, wet combustion method, in response to the recommendations made in the

previous review report. However, the inventory for the LULUCF sector remains incomplete (see table 3 above). The ERT reiterates the recommendation made in previous review reports that Croatia provide estimates for all land-use categories and pools in line with the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF).

64. In response to the recommendation made in the previous review report relating to the completeness of its reporting, Croatia has provided annual land-use change matrix tables. However, the reporting of land areas in the CRF tables remain incomplete, because the sum of the areas reported in the CRF tables is still not equal to the total area of Croatia. Land areas for the following categories were not included: annual cropland remaining annual cropland; and the settlements, wetlands and other land remaining categories. The ERT reiterates the recommendation made in previous review reports that Croatia include land areas for all land-use categories in the CRF tables in its next annual submission.

65. The ERT noted that the transparency of the NIR and the CRF tables could be improved. As already pointed out in the previous review report, additional explanation and reference materials need to be presented in the NIR regarding the basis for expert judgements and assumptions made (e.g. for the dead organic matter, litter and soil pools under forest land). The transparency of the estimates of emissions and removals reported in the CRF tables could also be improved by reporting emissions from organic cropland soils separately from emissions from mineral soils for all subdivisions and by reporting litter separately from soils for the converted land-use categories. The ERT recommends that Croatia improve the transparency of its reporting in the NIR and the CRF tables, in particular with regard to the issues identified above.

66. The ERT identified the incorrect use of notation keys in the CRF tables. For example, Croatia reports CO_2 emissions from annual and perennial cropland converted to forest land as "IE"; however, aggregate emissions from cropland converted to forest land are reported as "NO". Likewise, carbon stock change in organic soils for cropland converted to grassland is reported as "NO", while its subcategories (i.e. annual cropland converted to grassland and perennial cropland converted to grassland) are reported as "IE". In response to previous review stages in 2013, Croatia explained that the notation key for the subcategories should have been "NO". The ERT recommends that Croatia review the use of the notation keys in the CRF tables and improve the QC activities for the CRF tables.

67. Croatia provides detailed information in the category-specific planned improvements sections for each category of the NIR on the areas where it plans to make improvements to the inventory for the LULUCF sector to address recommendations made in previous review reports. The ERT recommends that Croatia carry out those planned improvements, particularly those envisaged to be completed for its next annual submission, and provide detailed information on any progress made and likely timing of the implementation of the other planned improvements, as the Party was encouraged to do in the previous review report.

2. Key categories

Forest land remaining forest land – CO_2

68. Following the recommendation made in the previous review report, Croatia provided explanations in its NIR as to why it assumes the dead organic matter and soil pools are not net sources (i.e. carbon inputs to dead organic matter and litter pools are actually increasing, and consequently the same applies to the soil pool into which carbon moves from dead organic matter and litter as they decompose). However, the ERT considered the information to be insufficient with regards to quantitative evidence to show that carbon inputs to those pools are larger than outputs from them. In response to a request made by

the ERT during the review, Croatia provided further explanation of the issue, together with supporting scientific literature,[5] which became available after the preparation of its 2013 annual submission (see also para. 84 below). Based on the literature, Croatia assumes that its forests are in the phase of accumulating carbon in the litter pool. The ERT welcomes the additional information and recommends that Croatia include the information in the NIR.

69. The reporting on this category is incomplete because estimates are only available for the following: high forests, plantations, cultures and coppices. Carbon stock change in maquia and scrub forests has not been estimated due to the lack of a complete data set for the emission calculation. Also, the ERT found that it was not clear in the NIR how emissions/removals associated with wildfires on maquia and scrub forests, which were not included in the 2012 annual submission due to lack of data, are handled in the current annual submission. In response to the questions raised by the ERT during the review, Croatia recognized the need for increased transparency with regard to carbon pools in maquia and scrub forests and expressed its intention to improve thereon in its next annual submission. In response to the question regarding wildfires, Croatia explained that the estimates of emissions from wildfires in the 2013 annual submission cover maquia and scrub forests but high forest biomass losses are used in the estimation because the AD for maquia and scrub forests are not identified. In order to provide more precise estimates of AD for maquia and scrub forests subject to wildfires in the next annual submission, the Party is in the process of requesting the necessary data from relevant institutions. The ERT welcomes the Party's progress and reiterates the recommendation made in previous review reports that the Party report emissions and removals for all forest types and carbon pools for forest land remaining forest land, and that Croatia determine the area of wildfires in maquia and scrub forests for estimating emissions/removals from that area, as well as the subsequent regrowth of biomass and dead organic matter.

70. The ERT noted that the result of the Croatian National Forest Inventory (CRONFI), which could potentially provide more precise data for estimating carbon stock changes in the dead wood, litter and soil pools with a higher tier and thus improve the accuracy of the inventory, is still under official consideration and is not yet available. In response to questions raised by the ERT during the review, Croatia explained that the use of data from CRONFI is foreseen as a long-term goal, possibly in time for the preparation of the 2015 annual submission at the earliest. This issue was already raised during the previous review; however, the Party did not provide any information on concrete progress to allow for the incorporation of data from CRONFI. The ERT recommends that Croatia make significant efforts to use the results of CRONFI to improve the LULUCF sector inventory for the 2015 annual submission.

Land converted to forest land – CO_2

71. Croatia reports the net CO_2 emissions/removals estimates for grassland converted to forest land only (–174.96 Gg in 2011), while area data is reported for grassland converted to forest land and other land converted to forest land. In the NIR, Croatia explains that the other land converted to forest land category is assumed to account for the remnant increase in afforested area. This approach has resulted in significant annual fluctuations of the area of other land converted to forest land, which makes it difficult to determine whether the area data are real or anomaly, as explained in the 2012 annual review report. Following the recommendation made in the previous review report, Croatia is undertaking an assessment to determine whether the land-use change is natural or human-induced and whether the land

[5] Maša Zorana Ostrogović. 2013. *Carbon Stocks and Carbon Balance in Even-aged Pedunculate Oak (Quercus Robur L.) Forest in River Kupa Basin*. Doctoral thesis, University of Zagreb, Faculty of Forestry.

is managed or unmanaged, as well as the exact year of the event of the land-use change. The ERT welcomes the launch of the assessment and recommends that the Party ensure its timely completion in order for the results to be reflected in the Party's 2014 annual submission.

Cropland remaining cropland – CO_2

72. Croatia uses a tier 1 approach for estimating carbon stock change in the biomass of perennial cropland remaining perennial cropland, which is a significant subcategory of cropland remaining cropland, accounting for most of the emissions from cropland remaining cropland (i.e. the estimate of net CO_2 emissions from cropland remaining cropland is 50.04 Gg and that of emissions from perennial cropland remaining perennial cropland is 50.91 Gg). According to the IPCC good practice guidance for LULUCF, it is good practice to use the tier 2 approach for estimating carbon stock change in a pool which is a significant subcategory of a key category. In response to questions raised by the ERT during the review, Croatia explained that carrying out a higher-tier approach is not possible in a short time period because it requires more precise national data or data/information originating from specific national field research on harvest cycles and carbon accumulation rates. The Party expressed its intention, in the next annual submission, to identify the use of a tier 2 method for estimating carbon stock change in the biomass pool of perennial cropland remaining perennial cropland as one of its long-term goals in relation to its LULUCF reporting. The ERT welcomes the indicated improvement and recommends that the Party include this as a long-term goal in the 2014 annual submission, and implement a tier 2 method as soon as possible.

3. Non-key categories

Land converted to settlements – CO_2

73. Following the recommendation made in the previous review report, Croatia estimated areas of lands converted to settlements on the basis of the expert judgement that settlements originate from forest land, grassland and cropland. The ERT welcomes the improvement and also reiterates the encouragement made in the previous review report for Croatia to develop a good-quality base map for 1990 from which to assess land-use changes.

F. Waste

1. Sector overview

74. In 2011, emissions from the waste sector amounted to 1,119.62 Gg CO_2 eq, or 3.9 per cent of total GHG emissions. Since 1990, emissions have increased by 83.3 per cent. The key driver for the rise in emissions is the increase in emissions from solid waste disposal on land. Within the sector, 68.9 per cent of the emissions were from solid waste disposal on land, followed by 31.1 per cent from wastewater handling and less than 0.1 per cent from waste incineration.

75. During the review, the ERT found some typographical errors in the CRF tables (e.g. N fraction in CRF table 6B is given as 16 kg N/kg protein instead of 0.16 kg N/kg protein) for 2011. In addition, the ERT noted that the NIR does not contain sufficient elaboration on sector-specific QA/QC activities. The ERT recommends that Croatia strengthen its QA/QC procedures to avoid such errors and provide more detailed information on sector-specific QA/QC activities, for example information on category-specific data checking procedures and independent verification.

2. Key categories

Solid waste disposal on land – CH_4

76. Croatia estimated CH_4 emissions from municipal solid waste (MSW) disposed to solid waste disposal sites using the tier 2 first-order decay method from the IPCC good practice guidance. The parameters used are mainly IPCC defaults, although some country-specific data (waste generation rate and MSW composition) are used for the emission estimation. The AD used in the emission estimation are mainly from CEA. However, information on type of waste disposed to solid waste disposal sites is not provided. The ERT recommends that Croatia provide information on the type of waste disposed to solid waste disposal sites and ensure that all types of solid waste, including industrial waste, sludge and construction and demolition waste, disposed to solid waste disposal sites are considered in the emission estimation.

Wastewater handling – CH_4

77. Croatia estimated CH_4 emissions from domestic and commercial wastewater handling. In its NIR Croatia explained that an aerobic biological process is mostly used for wastewater and sludge treatment and that the fraction of wastewater treated is 30 per cent, according to expert judgement. Data on the population with individual systems of drainage are used in the estimation of CH_4 emissions. However, the ERT considers that the information on wastewater treatment and discharge pathways provided in the NIR is insufficient. For example, the fraction of each wastewater type treated by a particular type of system is not reported. Therefore, the ERT recommends that Croatia provide more information on wastewater flows and treatment systems, using figure 5.3 of the IPCC good practice guidance as a guide, in order to consider all potential anaerobic treatment systems and discharge pathways (e.g. uncollected and discharged into the aquatic environment without treatment, etc.).

78. CH_4 emissions from industrial wastewater treatment were reported as "NE" and Croatia explained in its NIR that data for the calculation of the degradable organic component in kg chemical oxygen demand (COD)/year was not available in an appropriate form. In response to questions raised by the ERT during the review, Croatia clarified that data on industrial output, which are needed for the estimation of total organic wastewater, were not available in the unit of t/year, and that, in the previous annual submission, statistical data in m^3/year were used. The ERT considered that not estimating CH_4 emissions from industrial wastewater treatment could lead to incomplete estimation and underestimation of the emissions from wastewater treatment. In response to the list of potential problems and further questions raised by the ERT, Croatia estimated and reported CH_4 emissions from industrial wastewater treatment for the entire time series (1990–2011) using data on industrial output in the form needed for the estimation (t/year). The ERT commends Croatia for those estimates and recommends that the Party provide and explain the data used in the estimation in its NIR.

3. Non-key categories

Waste incineration – CO_2, CH_4 and N_2O

79. Croatia estimated CO_2 emissions from incineration for hazardous waste. CH_4 and N_2O emissions are reported as "NE". The NIR explains that N_2O emissions are not estimated because information on the type of incineration technology is not available. The ERT reiterates the recommendation made in the previous review report that Croatia identify the technologies applied in the incineration of hazardous waste, and recommends the Party to estimate N_2O emissions from waste incineration for its next annual submission.

G. Supplementary information required under Article 7, paragraph 1, of the Kyoto Protocol

1. Information on activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol

Overview

80. Table 6 provides an overview of the information reported and parameters selected by Croatia under Article 3, paragraphs 3 and 4, of the Kyoto Protocol.

Table 6
Supplementary information reported under Article 3, paragraphs 3 and 4, of the Kyoto Protocol

		Findings and recommendations
Has Croatia reported information in accordance with the requirements in paragraphs 5–9 of the annex to decision 15/CMP.1?	Not sufficient	Geographical identification and traceability of afforestation, reforestation and deforestation land have not yet been realized (see para. 81 below)
Identify any elected activities under Article 3, paragraph 4, of the Kyoto Protocol	Activity elected: forest management Years reported: 1990, 2008, 2009, 2010 and 2011	Not all types of forest under forest management are included in the carbon stock change estimation (e.g. maquia and scrub forest) (see paras. 84 and 85 below)
Identify the period of accounting	Commitment period accounting	
Assessment of Croatia's ability to identify areas of land and areas of land-use change	Not sufficient	Reporting on areas and related emissions and removals for forest other than state forest is missing. Croatia is implementing a plan to identify afforestation/reforestation and deforestation areas (see paras. 69 and 71 above, and 81 below)

Activities under Article 3, paragraph 3, of the Kyoto Protocol

81. For determining the areas of afforestation and reforestation and deforestation, geographically explicit data based on maps of such areas exist for the state forests. For the other forest categories (private and 'other state' forests), as explained by Croatia in the previous review, information on afforestation, reforestation and deforestation is provided from a forest area map and the Croatian forest land assessment system; however, the Party explained that the information is not as geographically explicit as that for the state forests. The ERT considers that this may make the identification and traceability of these lands a potential problem (decision 16/CMP.1, annex, paragraphs 19 and 20) and could result in a possible underestimation of emissions and removals from land subject to activities under Article 3, paragraph 3, of the Kyoto Protocol. In its NIR, Croatia stated that, for clear geographical identification and traceability, a further assessment of the measured data is needed and planned to be carried out before the preparation of its next annual submission. In response to a question raised by the ERT during the review, Croatia explained that a special plan was developed to address the issue in March 2013 and to be implemented by Croatian Forests Ltd. The ERT commends the Party for the improvement made and

strongly recommends that Croatia ensure that the planned improvements are completed for its next annual submission.

Afforestation and reforestation – CO_2

82. In response to recommendations made in the previous review report, Croatia has improved the coverage of forest types to include private and 'other state' forests in addition to the state forests. The Party has used tentative methods to obtain AD as a temporary solution before more precise estimation is to be done for the 2014 annual submission with AD that will be obtained from the analysis on afforestation and reforestation land traceability. Also, the ERT notes that data for maquia and scrub forests are not yet available, and that Croatia intends to improve the transparency on this point in the 2014 annual submission (see para. 69 above). The ERT strongly reiterates the recommendation made in the previous review report that Croatia estimate afforestation and reforestation for all land areas, using the more precise method proposed by the Party, for its next annual submission.

Deforestation – CO_2

83. In response to recommendations made in the previous review report, Croatia has improved the coverage of forest types to include private and 'other state' forests in addition to the state forests. The Party has used tentative methods to obtain AD as a temporary solution before more precise estimation is to be done for the 2014 annual submission with AD that will be obtained from the analysis on deforestation land traceability (see para. 69 above). The ERT notes that data for maquia and scrub forests are not yet available, although Croatia explained, in response to questions raised by the ERT during the review, that no harvest and conversion from maquia and scrub forests is assumed to occur based on the legal, social and economic circumstances elaborated in the NIR (section 11.3.1.1). The ERT strongly reiterates the recommendation made in the previous review report that Croatia estimate deforestation for all land areas, using the more precise method proposed by the Party, for its next annual submission.

Activities under Article 3, paragraph 4, of the Kyoto Protocol

Forest management – CO_2

84. Croatia reports "NO" for carbon stock changes in dead organic matter, litter and soil pools with the assumptions that they are not net sources. However, the ERT noted that sufficient verifiable information was not provided in the NIR to justify that these pools are not net sources. In response to the question raised by the ERT during the review, Croatia provided further explanation on this issue together with supporting scientific literature[6] which had become available after the 2013 annual submission. Based on the literature, Croatia assumes that its forests are in the phase of accumulating carbon in the litter pool as well as dead organic matter and subsequently in soil. The ERT welcomes the additional information and recommends that Croatia include the information in the NIR (see also para. 68 above).

85. As outlined in paragraph 69 above in relation to forest land remaining forest land, carbon stock changes for maquia and scrub forests have not been estimated under forest management. The ERT strongly reiterates the recommendation made in the previous review reports that Croatia estimate emissions and removals for all managed forest types.

[6] Maša Zorana Ostrogović, 2013. "*Carbon Stocks and Carbon Balance in Even-aged Pedunculate Oak (Quercus Robur L.) Forest in River Kupa Basin*".

2. Information on Kyoto Protocol units

Standard electronic format and reports from the national registry

86. Croatia has reported information on its accounting of Kyoto Protocol units in the required SEF tables, as required by decisions 15/CMP.1 and 14/CMP.1. The ERT took note of the findings and recommendations included in the standard independent assessment report (SIAR) on the SEF tables and the SEF comparison report.[7] The SIAR was forwarded to the ERT prior to the review, pursuant to decision 16/CP.10. The ERT reiterated the main findings and recommendations contained in the SIAR, which are related to missing accounts, holding and transaction information and to the inclusion of all public information either directly on the website of the national registry or via a link from the registry website to another website controlled by the Party.

87. The ERT took note that Croatia reported that the only transaction performed was the issuance of assigned amount units in February 2012 and that the registry does not have open accounts, except national accounts.

Calculation of the commitment period reserve

88. Croatia has reported its commitment period reserve in its 2013 annual submission. Croatia reported that its commitment period reserve has not changed since the initial report review (133,900,653 t CO_2 eq) as it is based on the assigned amount and not the most recently reviewed inventory. The ERT agrees with this figure.

3. Changes to the national system

89. Croatia reported that there are changes in its national system since its previous annual submission. Croatia described the changes in its NIR, namely two new legal documents (dated July 2012 and December 2012) to further harmonize the national system with the requirements of the European Union mechanisms for monitoring and reporting GHG emissions. The ERT concluded that Croatia's national system continues to be in accordance with the requirements of national systems outlined in decision 19/CMP.1.

4. Changes to the national registry

90. Croatia reported that there are no changes in its national registry since its previous annual submission. The ERT concluded that Croatia's national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1, and continues to adhere to the technical standards for data exchange between registry systems in accordance with relevant decisions of the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol.

5. Minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol

91. Croatia has made a major revision to its reporting on the minimization of adverse impacts compared with its previous annual submission in order to provide more detailed and transparent information on the actions undertaken by it to mitigate climate change. Croatia reported that there are no significant changes in policies and measures to minimize adverse impacts in accordance with Article 3, paragraph 14, since the previous annual

[7] The SEF comparison report is prepared by the international transaction log (ITL) administrator and provides information on the outcome of the comparison of data contained in Croatia's SEF tables with corresponding records contained in the ITL.

submission. The ERT concluded that the information provided continues to be complete and transparent.

92. Croatia reported information on the national policy context, key instruments for climate change mitigation, the changes and improvements in the energy sector and cross-border cooperation with and the provision of assistance to developing countries in the region.

93. Croatia also reported that it is of the opinion that, owing to its size, share in international trade and GHG footprint, policies and measures implemented in the country do not have any significant adverse economic, social or environmental impacts on developing countries, nor will they in the future.

III. Conclusions and recommendations

A. Conclusions

94. Table 7 summarizes the ERT's conclusions on the 2013 annual submission of Croatia, in accordance with the Article 8 review guidelines.

Table 7
Expert review team's conclusions on the 2013 annual submission of Croatia

		Paragraph cross-references
The expert review team (ERT) concludes that the inventory submission of Croatia is complete (categories, gases, years and geographical boundaries and contains both an NIR and CRF tables for 1990–2011)		
Annex A sources[a]	Complete	
LULUCF[a]	Not complete	63 and 64
KP-LULUCF	Not complete	82, 83 and 85
The ERT concludes that the inventory submission of Croatia has been prepared and reported in accordance with the UNFCCC reporting guidelines	Yes	
The submission of information required under Article 7, paragraph 1, of the Kyoto Protocol has been prepared and reported in accordance with decision 15/CMP.1	Yes	6 and 7
Croatia's inventory is in accordance with the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* and the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry*	Yes	
Croatia has reported information on Article 3, paragraphs 3 and 4, of the Kyoto Protocol	Yes	80–85
Croatia has reported information on its accounting of Kyoto Protocol units in accordance with decision 15/CMP.1, annex,	Yes	86 and 87

		Paragraph cross-references
chapter I.E, and used the required reporting format tables as specified by decision 14/CMP.1		
The national system continues to perform its required functions as set out in the annex to decision 19/CMP.1	Yes	89
The national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1 and continues to adhere to the technical standards for data exchange between registry systems in accordance with relevant decisions of the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol	Yes	90
Did Croatia provide information in the NIR on changes in its reporting of the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol?	Yes	91–93

Abbreviations: CRF = common reporting format, Annex A sources = sources included in Annex A to the Kyoto Protocol, IPCC = Intergovernmental Panel on Climate Change, KP-LULUCF = land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, LULUCF = land use, land-use change and forestry, NIR = national inventory report, UNFCCC reporting guidelines = "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories".

[a] The assessment of completeness by the ERT considers only the completeness of reporting of mandatory categories (i.e. categories for which methods and default emission factors are provided in the Intergovernmental Panel on Climate Change (IPCC) *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*, or the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry*).

B. Recommendations

95. The ERT identified the issues for improvement listed in table 8. All recommendations are for the next annual submission, unless otherwise specified.

Table 8
Recommendations identified by the expert review team

Sector	*Category*	*Recommendation*	*Paragraph cross-references*
Cross-cutting	Key category analysis	Include more explanation of how the key category analysis is used to prioritize the development and improvement of the inventory, including methodological choices	Table 4
	Inventory management	Ensure that the inventory management system functions in such a way as to allow the provision of timely responses to the ERT	17
		Improve transparency by providing in the table references to specific sections of the NIR (e.g. paragraph numbers) to indicate where such recommendations are covered	18
Energy	Comparison of	Report details including the quantifiable information of	24

Sector	*Category*	*Recommendation*	*Paragraph cross-references*
	the reference approach with the sectoral approach and international statistics	an analysis of the fuels behind the discrepancy	
		Examine the reasons for discrepancies in comparison with IEA data and explain the results of such investigations	25
	International bunker fuels	Implement the plan to further explore the difference between the data reported in the CRF tables and the IEA data and reflect the results	26
		Provide a more detailed explanation of the drivers underlying the high inter-annual variation in the estimated CO_2 emissions	27
	Feedstocks and non-energy use of fuels	Provide more detail on feedstocks and the non-energy use and allocation of fuels	28
	Stationary combustion: solid, liquid and gaseous fuels – CO_2	Apply country-specific factors to estimate emissions for the main fuel types	29
		If country-specific factors are not available, include the implementation timeline for the plan to apply country-specific factors to estimate emissions for the main fuel types	29
	Road transportation: all fuels – CO_2	Use a tier 1 approach to estimate CO_2 emissions from road transportation for all fuels	30
	Coal mining and handling: solid fuels – CH_4	Revise the estimates of CH_4 emissions for this category and clearly document the revision, including the AD used and the sources of the EFs used, and improve QA/QC procedures	31
	Oil and natural gas: liquid and gaseous fuels – CO_2, CH_4 and N_2O	Take steps towards reporting emissions from venting and flaring separately and describe the progress made in its NIR	32
		Estimate CH_4 emissions from transmission and distribution using a higher-tier method	33
	Other (mobile): liquid fuels –	Report military fuel combustion under other (fuel	34

Sector	*Category*	*Recommendation*	*Paragraph cross-references*
	CO_2, CH_4 and N_2O	combustion)	
		If data are not available, use the notation key "IE" to report the emissions	34
Industrial processes and solvent and other product use	Sector overview	Continue to improve the information on recalculations	36
	Ammonia production – CO_2	Implement the results of its plan to refine the AD	37
		Provide more detailed and specific explanation with regard to the approach used for the split between natural gas used as fuel and natural gas used as feedstock	38
		Review its emission estimation methodology for this category and provide clearer justification of its IEF estimation	39
	Ferroalloys production – CO_2	Obtain AD for ferroalloys production to replace the interpolated data	40
	Consumption of halocarbons and SF_6 – HFCs	Continue to conduct surveys on the status of disposal of refrigeration and air-conditioning equipment and include the results in its NIR	41
		Further improve the reporting by conducting the necessary surveys to obtain AD for the estimation of actual emissions of HFC-152a for the entire time series	42
		Continue its effort to report emissions from import and export separately in future inventory submissions	43
	Solvent and other product use	Either provide clear information to justify that N_2O emission from fire extinguishers and other activities do not occur (in which case change the notation key from "NE" to "NO") or conduct the necessary surveys and report emissions accordingly	44
Agriculture	Sector overview	Estimate CH_4 emissions from enteric fermentation (for all animals except cattle) and CH_4 and N_2O emissions from manure management (for sheep, goats, horses, mules/asses, and poultry), applying the default EFs for developed countries for all years of the time series in its next annual submission	46
		Apply the correct notation keys in the reporting on the agriculture sector	47
		Include in the NIR background information on the evaluation of AD compiled by the Croatian Bureau of	48

Sector	*Category*	*Recommendation*	*Paragraph cross-references*
		Statistics and the Croatian Horse Breeding Centre; information on how time-series consistency is ensured if different sources of data have been chosen; data sources for and information on the representativeness of the yearly average milk yields; clear references to equations, parameters and EFs in order to improve transparency of documentation	
		Apply new study results to estimate emissions from enteric fermentation (cattle) and manure management (cattle and swine) as soon as new project results are available	49
		Report all relevant parameters and fractions related to the AD and the calculation of N_2O emissions from N-fixing crops and crop residues in CRF table 4.F	50
	Enteric fermentation – CH_4	Improve the sector-specific routine QC procedures, especially at the stage of data transfer from the calculation sheet to the CRF tables	51
		Update a list of sector-specific improvements and implement the improvement on schedule	52
	Manure management – CH_4	Apply a tier 2 method in its CH_4 emission estimates in NIR 2015 reflecting the result of new projects to develop tier 2 estimates with country-specific EFs and AWMS distribution	53 and 54
		Continue its efforts to develop country-specific values for the estimation of CH_4 emissions from manure management and apply new study results for emission calculation in its 2015 NIR	54
	Manure management – N_2O	Starts the work as soon as possible in order to include the refined estimates based on country-specific N excretion values and AWMS data	55
		Revises its calculation using country-specific data as soon as new study results are available	56
		Ensure the consistency of the multiplication of the number of swine by the N excretion value per swine in CRF table 4.B(b) and the sum of N excreted in all AWMS	57
	Agricultural soils – N_2O	Provide information on the start of the application of sewage sludge to agricultural land from 2005 onwards and on the non-occurrence of slurry discharge from domestic septic tanks on agricultural land	61
LULUCF	Sector overview	Provide estimates for all land-use categories and pools in line with the IPCC good practice guidance for LULUCF	63
		Include land areas for all land-use categories in the	64

Sector	*Category*	*Recommendation*	*Paragraph cross-references*
		CRF tables	
		Improve the transparency of the reporting by providing additional explanation of and reference materials for expert judgements and assumptions, by reporting emissions from organic soils separately from emissions from mineral soils for all subdivisions under cropland and by reporting litter separately from soils for the converted land-use categories	65
		Review the use of the notation keys in the CRF tables and improve the QC of the CRF tables	66
		Implement the planned improvements, particularly those envisaged to be completed for the next annual submission, and provide detailed information on any progress made and the likely timing of completion of the other planned improvements	67
	Forest land remaining forest land – CO_2	Provide a justification for the assumption that the dead organic matter, litter and soil are not net sources	68
		Report emissions and removals for all forest types and carbon pools	69
		Determine the area of wildfires on maquia and scrub forests and estimate emissions and removals from the area and the subsequent regrowth of biomass and dead organic matter	69
		Make efforts to advance and complete the implementation of the Croatian National Forest Inventory, use the results to improve the LULUCF sector inventory	70
	Land converted to forest land– CO_2	Complete the assessment carried out concerning whether this land-use change is natural or human-induced and whether the land is managed or unmanaged, as well as the exact year of the event of the land-use change	71
	Cropland remaining cropland– CO_2	Use a higher tier approach to estimate carbon stock changes in perennial cropland remaining perennial cropland	72
Waste	Sector overview	Strengthen QA/QC procedures to avoid errors and provide more detailed information on sector-specific QA/QC activities	75
	Solid waste disposal on land – CH_4	Provide information on the type of waste disposed to solid waste disposal sites and ensure that all types of solid waste, including industrial waste, sludge and construction and demolition waste, disposed to solid waste disposal sites are considered in the emission	76

Sector	*Category*	*Recommendation*	*Paragraph cross-references*
		estimation	
	Wastewater handling – CH_4	Provide more information on wastewater flows and treatment systems	77
		Provide and explain the data used in the estimation to estimate CH_4 emissions from industrial wastewater treatment	78
	Waste incineration – N_2O	Identify the technologies applied in the incineration of hazardous waste and estimate and report the associated N_2O emissions	79
KP-LULUCF	Activities under Article 3, paragraph 3, of the Kyoto Protocol	Implement the planned improvement to ensure the identification and traceability of afforestation, reforestation and deforestation land and provide detailed information thereon	81
	Afforestation and reforestation	Estimate afforestation and reforestation for all land areas, using the more precise method proposed by the Party, for its next annual submission	82
	Deforestation	Estimate deforestation for all land areas, using the more precise method proposed by the Party, for its next annual submission	83
	Forest management	Provide the justification in the NIR of the Party's assumption that the dead organic matter, litter and soil are not net sources	84
		Estimate emissions and removals from all managed forest types	85
Standard electronic format and reports from the national registry		Ensure that all account information, holding and transaction information and all other public information is available online	86

Abbreviations: AD = activity data, AWMS = animal waste management system, CRF = common reporting format, EF = emission factor, ERT = expert review team, IE = included elsewhere, IEA = International Energy Agency, IEF = implied emission factor, IPCC = Intergovernmental Panel on Climate Change, IPCC good practice guidance = IPCC *Good Practice Guidance for National Greenhouse Gas Inventories and Uncertainty Management*, IPCC good practice guidance for LULUCF = IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry*, KP-LULUCF = land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, LULUCF = land use, land-use change and forestry, N = nitrogen, NE = not estimated, NIR = national inventory report, NO = not occurring, QA/QC = quality assurance/quality control.

IV. Questions of implementation

96. No questions of implementation were identified by the ERT during the review.

Annex I

Background data on recalculations and information to be included in the compilation and accounting database

Table 9
Recalculations in the 2013 annual submission for the base year and the most recent year

Greenhouse gas source and sink categories	*1990*	*2010*	*1990*	*2010*	*Reason for the recalculation*
	Value of recalculation (Gg CO_2 eq)		*Per cent change*		
1. Energy	0.04	18.30	0.0	0.1	Change in AD, EF
A. Fuel combustion (sectoral approach)		18.27		0.1	
1. Energy industries					
2. Manufacturing industries and construction		48.98		1.5	
3. Transport		–30.71		–0.5	
4. Other sectors					
5. Other					
B. Fugitive emissions from fuels	0.04	0.02	0.0	0.0	
1. Solid fuels					
2. Oil and natural gas	0.04	0.02	0.0	0.0	
2. Industrial processes	–22.30	–28.07	–0.6	–0.9	Changes in method, EF, AD, and correction of notation keys used
A. Mineral products		9.47		0.7	
B. Chemical industry	–22.30	–34.04	–1.7	–2.6	
C. Metal production					
D. Other production					
E. Production of halocarbons and SF_6					
F. Consumption of halocarbons and SF_6		–3.51		–0.7	
G. Other					
3. Solvent and other product use	–0.16	1.77	–0.1	1.2	Changes according to LRTAP
4. Agriculture		50.89		1.6	Changes in AD and editorial changes
A. Enteric fermentation					
B. Manure management		67.39		18.2	

Greenhouse gas source and sink categories	1990	2010	1990	2010	Reason for the recalculation
	Value of recalculation (Gg CO_2 eq)		Per cent change		
C. Rice cultivation					
D. Agricultural soils		–16.50		–0.8	
E. Prescribed burning of savannas					
F. Field burning of agricultural residues					
G. Other					
5. Land use, land-use change and forestry	–818.84	411.85	14.6	–5.0	Change in method, new AD, correction of unit and correction of notation keys used
A. Forest land	–971.04	288.26	16.2	–3.3	
B. Cropland	88.79	140.04	116.8	–1082.8	
C. Grassland	76.93	118.32	–47.5	–45.8	
D. Wetlands	–1.56	–10.34	–27.8	–35.3	
E. Settlements	–1.97	–124.42	–0.4	–17.5	
F. Other land					
G. Other					
6. Waste	–0.88	15.53	–0.1	1.4	AD
A. Solid waste disposal on land	0.00	–23.91	0.0	–3.1	
B. Wastewater handling	–0.88	39.44	–0.2	12.6	
C. Waste incineration					
D. Other					
7. Other					
Total CO_2 equivalent without LULUCF	**–23.30**	**58.42**	**–0.1**	**0.2**	
Total CO_2 equivalent with LULUCF	**–842.14**	**470.27**	**–3.2**	**2.3**	

Abbreviations: AD = activity data, EF = emission factor, LRTAP = Convention on Long-range Transboundary Air Pollution, LULUCF = land use, land-use change and forestry.

Table 10
Information to be included in the compilation and accounting database in t CO_2 eq for 2011, including the commitment period reserve

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Commitment period reserve	133 900 653			133 900 653
Annex A emissions for 2011				
CO_2	20 869 291			20 869 291
CH_4	3 509 105	3 581 297		3 581 297
N_2O	3 392 283	3 485 111		3 485 111
HFCs	475 939			475 939
PFCs	13			13
SF_6	9 817			9 817
Total Annex A sources	**28 256 448**	**28 421 468**		**28 421 468**
Activities under Article 3, paragraph 3, for 2011				
3.3 Afforestation and reforestation on non-harvested land for 2011	–191 579			–191 579
3.3 Afforestation and reforestation on harvested land for 2011	NA, NO			NA, NO
3.3 Deforestation for 2011	371 589			371 589
Activities under Article 3, paragraph 4, for 2011[c]				
3.4 Forest management for 2011	–7 452 301			–7 452 301
3.4 Cropland management for 2011				
3.4 Cropland management for the base year				
3.4 Grazing land management for 2011				
3.4 Grazing land management for the base year				
3.4 Revegetation for 2011				
3.4 Revegetation in the base year				

Abbreviations: NA = not applicable, NO = not occurring.
[a] "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).
[b] "Final" includes revised estimates, if any, and/or adjustments, if any.
[c] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Table 11
Information to be included in the compilation and accounting database in t CO_2 eq for 2010

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Annex A emissions for 2010				
CO_2	21 288 788			21 288 788
CH_4	3 566 006	3 638 968		3 638 968
N_2O	3 279 093	3 371 293		3 371 293
HFCs	472 251			472 251
PFCs	29			29
SF_6	9 319			9 319
Total Annex A sources	**28 615 485**	**28 780 648**		**28 780 648**
Activities under Article 3, paragraph 3, for 2010				
3.3 Afforestation and reforestation on non-harvested land for 2010	–178 648			–178 648
3.3 Afforestation and reforestation on harvested land for 2010	NA, NO			NA, NO
3.3 Deforestation for 2010	411 353			411 353
Activities under Article 3, paragraph 4, for 2010[c]				
3.4 Forest management for 2010	–8 298 556			–8 298 556
3.4 Cropland management for 2010				
3.4 Cropland management for the base year				
3.4 Grazing land management for 2010				
3.4 Grazing land management for the base year				
3.4 Revegetation for 2010				
3.4 Revegetation in the base year				

Abbreviations: NA = not applicable, NO = not occurring.
[a] "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).
[b] "Final" includes revised estimates, if any, and/or adjustments, if any.
[c] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Table 12
Information to be included in the compilation and accounting database in t CO_2 eq for 2009

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Annex A emissions for 2009				
CO_2	21 982 480			21 982 480
CH_4	3 521 784	3 598 843		3 598 843
N_2O	3 210 129	3 317 469		3 317 469
HFCs	435 677			435 677
PFCs	204			204
SF_6	8 393			8 393
Total Annex A sources	**29 158 667**	**29 343 066**		**29 343 066**
Activities under Article 3, paragraph 3, for 2009				
3.3 Afforestation and reforestation on non-harvested land for 2009	–182 373			–182 373
3.3 Afforestation and reforestation on harvested land for 2009	NA, NO			NA, NO
3.3 Deforestation for 2009	441 861			441 861
Activities under Article 3, paragraph 4, for 2009[c]				
3.4 Forest management for 2009	–8 417 931			–8 417 931
3.4 Cropland management for 2009				
3.4 Cropland management for the base year				
3.4 Grazing land management for 2009				
3.4 Grazing land management for the base year				
3.4 Revegetation for 2009				
3.4 Revegetation in the base year				

Abbreviations: NA = not applicable, NO = not occurring.

[a] "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).

[b] "Final" includes revised estimates, if any, and/or adjustments, if any.

[c] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Table 13
Information to be included in the compilation and accounting database in t CO_2 eq for 2008

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Annex A emissions for 2008				
CO_2	23 755 724			23 755 724
CH_4	3 518 029	3 610 988		3 610 988
N_2O	3 456 246	3 569 912		3 569 912
HFCs	424 164			424 164
PFCs	NA, NO			NA, NO
SF_6	12 554			12 554
Total Annex A sources	**31 166 718**	**31 373 343**		**31 373 343**
Activities under Article 3, paragraph 3, for 2008				
3.3 Afforestation and reforestation on non-harvested land for 2008	–178 507			–178 507
3.3 Afforestation and reforestation on harvested land for 2008	NA, NO			NA, NO
3.3 Deforestation for 2008	495 872			495 872
Activities under Article 3, paragraph 4, for 2008[c]				
3.4 Forest management for 2008	–8 174 039			–8 174 039
3.4 Cropland management for 2008				
3.4 Cropland management for the base year				
3.4 Grazing land management for 2008				
3.4 Grazing land management for the base year				
3.4 Revegetation for 2008				
3.4 Revegetation in the base year				

Abbreviations: NA = not applicable, NO = not occurring.
[a] "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).
[b] "Final" includes revised estimates, if any, and/or adjustments, if any.
[c] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Annex II

Documents and information used during the review

A. Reference documents

Intergovernmental Panel on Climate Change. *2006 IPCC Guidelines for National Greenhouse Gas Inventories*. Available at <http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html>.

Intergovernmental Panel on Climate Change. *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*. Available at <http://www.ipcc-nggip.iges.or.jp/public/gl/invs1.htm>.

Intergovernmental Panel on Climate Change. *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*. Available at <http://www.ipcc-nggip.iges.or.jp/public/gp/english/>.

Intergovernmental Panel on Climate Change. *Good Practice Guidance for Land Use, Land-Use Change and Forestry*. Available at <http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf.htm>.

"Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories". FCCC/SBSTA/2006/9. Available at <http://unfccc.int/resource/docs/2006/sbsta/eng/09.pdf>.

"Guidelines for the technical review of greenhouse gas inventories from Parties included in Annex I to the Convention". FCCC/CP/2002/8. Available at <http://unfccc.int/resource/docs/cop8/08.pdf>.

"Guidelines for national systems under Article 5, paragraph 1, of the Kyoto Protocol". Decision 19/CMP.1. Available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a03.pdf#page=14>.

"Guidelines for the preparation of the information required under Article 7 of the Kyoto Protocol". Decision 15/CMP.1. Available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a02.pdf#page=54>.

"Guidelines for review under Article 8 of the Kyoto Protocol". Decision 22/CMP.1. Available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a03.pdf#page=51>.

Status report for Croatia 2013. Available at <http://unfccc.int/resource/docs/2013/asr/hrv.pdf>.

Synthesis and assessment report on the greenhouse gas inventories submitted in 2013. Available at <http://unfccc.int/resource/webdocs/sai/2013.pdf>.

FCCC/ARR/2012/HRV. Report of the individual review of the annual submission of Croatia submitted in 2012. Available at <http://unfccc.int/resource/docs/2013/arr/hrv.pdf>.

UNFCCC Standard independent assessment report, parts 1 and 2. Available at <http://unfccc.int/kyoto_protocol/registry_systems/independent_assessment_reports/items/4061.php>.

B. Additional information provided by the Party

Responses to questions during the review were received from Ms. Vlatka Palčić (Ministry of Environmental and Nature Protection), including additional material on the methodologies and assumptions used. The following document[1] was also provided by Croatia:

Maša Zorana Ostrogović, 2013. "*Carbon Stocks and Carbon Balance in Even-aged Pedunculate Oak (Quercus Robur L.) Forest in River Kupa Basin*", Doctoral thesis, University of Zagreb, Faculty of Forestry.

[1] Reproduced as received from the Party.

Annex III

Acronyms and abbreviations

AD	activity data
AWMS	animal waste management system
CH_4	methane
CMP	Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
COD	chemical oxygen demand
CRF	common reporting format
EF	emission factor
ERT	expert review team
GHG	greenhouse gas; unless indicated otherwise, GHG emissions are the sum of CO_2, CH_4, N_2O, HFCs, PFCs and SF_6 without GHG emissions and removals from LULUCF
HFCs	hydrofluorocarbons
IE	included elsewhere
IEA	International Energy Agency
IEF	implied emission factor
IPCC	Intergovernmental Panel on Climate Change
ITL	international transaction log
kg	kilogram (1 kg = 1,000 grams)
KP-LULUCF	land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol
LULUCF	land use, land-use change and forestry
m^3	cubic metre
N	nitrogen
N_2O	nitrous oxide
NA	not applicable
NE	not estimated
Nex	nitrogen excretion
NIR	national inventory report
NO	not occurring
PFCs	perfluorocarbons
PJ	petajoule (1 PJ = 10^{15} joules)
QA/QC	quality assurance/quality control
SEF	standard electronic format
SF_6	sulphur hexafluoride
SIAR	standard independent assessment report
UNFCCC	United Nations Framework Convention on Climate Change